AECL EACL

Annual Program Report

Application of the Alternative Fuels Act 2007/2008

AECL's Environmental Protection Program

CW-509248-REPT-002
Revision 0

2008 August

UNRESTRICTED

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2251 Speakman Drive
Mississauga, Ontario
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août 2008

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1. GENERAL INTRODUCTION

As stated in AECL's corporate Environment Policy, "AECL includes protection of the environment as an integral component of our decision-making in all phases of our business activities." This policy statement requires the management of the vehicle fleet to meet or exceed the requirements of the Alternative Fuels Act [1].

Through *The Alternative Fuels Act*, (AF Act) [1] the Government of Canada has partially addressed its commitment to reform and obtain better control over the emissions of greenhouse gases from the use of internal combustion engines. Specifically, the Act requires a percentage of new vehicles acquired by a Federal body or a Federal Crown Corporation to be capable of operating on alternative fuels where cost effective and operationally feasible and requires the obligatory use of alternative fuels in vehicles so equipped. In addition, these bodies are required to report to Parliament annually on their progress in meeting those targets.

This is the eleventh annual report by AECL as required by the Act and covers the fiscal year 2007 to 2008.

AECL operates a number of sites across Canada. The bulk of AECL's vehicle fleet is operated out of only three of these, Chalk River Laboratories (CRL), Chalk River, Ontario, Whiteshell Laboratories (WL), Pinawa, Manitoba, and Sheridan Park (SP), Mississauga, Ontario. Other sites, specifically, Douglas Point in Tiverton, Ontario, Point Lepreau in New Brunswick, and Laprade in Quebec maintain small fleets. During the fiscal year (FY) 2007/2008, AECL operated a total fleet of 143 vehicles subject to the *Alternative Fuels Act* [1].

Table 1-1 provides details of the AECL fleet as to their type (as defined in Treasury Board's *Government Motor Vehicles Ordering Guide* [2] and their respective fuel use. Included is whether those vehicles are capable of being operated on an alternative fuel, and whether they are actually being operated on the fuel.

Table 1-1
Fuel Use by AECL's Vehicle Fleet in FY 2007/2008

		Total Vehicles in Fleet 2007/2008				Fuel Use Capability (# Vehicles by Fuel Type)							# for which Alternative Fuel Use is Feasible		Actual Fuel Usage (# Vehicles by Fuel Type)						
						Non-alternative		Alternative Fuels							Non-alternative		Alternative Fuels				
Site	Vehicle Type	Start	Acquire	Remove	End	Gas	Diesel	Propane	Ethanol	Other	Blend >50%	Blend <50%	Operational	Cost Effective	Gas	Diesel	Propane	Ethanol	Other	Blend >50%	Blend <50%
CRL	Automobiles	1	-	-	1	1	-	-	-	-	-	1	1	1	-	-	-	-	-	-	1
	Passenger Vans	11	1	-	12	11	1	-	-	-	-	11	11	11	-	1	-	-	-	-	11
	Light Duty Trucks	30	7	-	37	36	1	-	-	-	-	36	36	36	-	1	-	-	-	-	36
	Med. Duty Trucks	18	4	-	22	20	2	-	-	-	-	20	20	20	-	2	-	-	-	-	20
	Buses	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WL	Automobiles	1	-	-	1	1	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-
	Passenger Vans	8	-	1	7	6	1	-	-	-	-	6	-	-	6	1	-	-	-	-	-
	Light Duty Trucks	12	1	-	13	13	-	-	-	-	-	13	-	-	13	-	-	-	-	-	-
	Med. Duty Trucks	12	-	-	12	10	2	-	-	-	-	10	-	-	10	2	-	-	-	-	-
	Buses	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sheridan Park	Automobiles	16	4	2	18	18	-	-	-	-	-	18	18	18	-	-	-	-	-	-	18 (*)
	Passenger Vans	6	-	1	5	5	-	-	-	-	-	5	5	5	-	-	-	-	-	-	5 (*)
	Light Duty Trucks	4	-	-	4	4	-	-	-	-	-	4	4	4	-	-	-	-	-	-	4 (*)
	Med. Duty Trucks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Buses	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Sites	Automobiles	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Passenger Vans	4	-	-	4	4	-	-	-	-	-	4	-	-	4	-	-	-	-	-	-
	Light Duty Trucks	7	-	-	7	7	-	-	-	-	-	7	-	-	7	-	-	-	-	-	-
	Med. Duty Trucks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Buses	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AECL Total	Automobiles	18	4	2	20	20	-	-	-	-	-	20	19	19	1	-	-	-	-	-	19
	Passenger Vans	29	1	2	28	26	2	-	-	-	-	26	16	16	10	2	-	-	-	-	16
	Light Duty Trucks	53	8	-	61	60	1	-	-	-	-	60	40	40	20	1	-	-	-	-	40
	Med. Duty Trucks	30	4	-	34	30	4	-	-	-	-	30	20	20	10	4	-	-	-	-	20
	Buses	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Totals	**130**	**17**	**4**	**143**	**136**	**7**	-	-	-	-	**136**	**95**	**95**	**41**	**7**	-	-	-	-	**95**

Note: All gasoline vehicles are capable of operating with a 10% blend of ethanol in gasoline. Therefore the gasoline vehicles are included in the column "Blend <50%"

* Sheridan Park vehicles are run on a minimum of a 10% blend of ethanol where possible.

2. VEHICLES ACQUIRED IN FY 2007/2008

Under provisions of the *AF Act* [1] any vehicle acquired during the fiscal year must be assessed to determine whether it is cost effective and economically feasible to operate the vehicle on an alternative fuel. During the 2007/2008 FY, 17 vehicles were acquired. Details of the acquisition are given in Table 2-1. All of these vehicles fall within the provisions of the *AF Act* [1], therefore they were evaluated to determine their alternative fuel capability and whether it is cost effective and operationally feasible. A description of the evaluation criteria is given in Section 4.1. Table 2-2 provides a summary of the evaluation results.

Table 2-1
Vehicles Acquired by AECL in FY 2007/2008

		# Vehicles Acquired	# For which Alternative Fuel Use is Feasible		Fuel Use Capability (# Vehicles by Fuel Type)					
					Non-Alternative		Alternative Fuels			
Site	Vehicle Type		Operational	Cost Effective	Gasoline	Diesel	Propane	Ethanol	Other	Blend < 50%
CRL	Automobiles	-	-	-	-	-	-	-	-	-
	Passenger Vans	1	1	1	1	-	-	-	-	1
	Light Duty Trucks	7	7	7	7	-	-	-	-	7
	Med. Duty Trucks	4	3	3	3	1	-	-	-	3
	Buses	-	-	-	-	-	-	-	-	-
WL	Automobiles	-	-	-	-	-	-	-	-	-
	Passenger Vans	-	-	-	-	-	-	-	-	-
	Light Duty Trucks	1	-	-	1	-	-	-	-	1
	Med. Duty Trucks	-	-	-	-	-	-	-	-	-
	Buses	-	-	-	-	-	-	-	-	-
Sheridan Park	Automobiles	4	4	4	4	-	-	-	-	4
	Passenger Vans	-	-	-	-	-	-	-	-	-
	Light Duty Trucks	-	-	-	-	-	-	-	-	-
	Med. Duty Trucks	-	-	-	-	-	-	-	-	-
	Buses	-	-	-	-	-	-	-	-	-
Other Sites	Automobiles	-	-	-	-	-	-	-	-	-
	Passenger Vans	-	-	-	-	-	-	-	-	-
	Light Duty Trucks	-	-	-	-	-	-	-	-	-
	Med. Duty Trucks	-	-	-	-	-	-	-	-	-
	Buses	-	-	-	-	-	-	-	-	-
AECL Total	Automobiles	4	-	-	4	-	-	-	-	4
	Passenger Vans	1	-	-	1	-	-	-	-	1
	Light Duty Trucks	8	-	-	8	-	-	-	-	8
	Med. Duty Trucks	4	-	-	3	1	-	-	-	3
	Buses	-	-	-	-	-	-	-	-	-
	Totals	17	15		16	1	-	-	-	16

Table 2-2
Summary of Vehicles Acquired by AECL in FY 2007/2008

MOTOR VEHICLE ACQUISITION SUMMARY	2007/2008
Total number of motor vehicles acquired	17
Total number of vehicles acquired for which it is "cost effective and operationally feasible" to operate on alternative fuel (<50% ethanol blended fuel)	15
Total number of vehicles acquired capable of operating on alternative fuel	16
Acquired vehicles operating on alternative fuels as % of number for which it is "cost effective and operationally feasible"	88%
Alternative Fuels Act [1] acquisition target (% of acquired vehicle operating on an alternative fuel if cost effective and operationally feasible)	75%

3. VEHICLES OPERATED ON ALTERNATIVE FUELS

Under provisions of the *AF Act* [1], where it is cost effective and operationally feasible to do so, any motor vehicle capable of operating on an alternative fuel must do so. Again an evaluation was done to determine whether for a particular vehicle, it was cost effective and operationally feasible to use an alternative fuel. Of the 143 vehicles in AECL's fleet, 95 (at SP and CRL) operate on Ethanol blended fuel (E -10). The evaluation criteria are described in Section 4.1 below.

Table 3-1 provides a summary of the vehicles capable of and actually operating on the alternative fuels. It can be seen that all of AECL's vehicles capable of operating on an alternative fuel are using that fuel where cost effective and operationally feasible.

It should be noted that all vehicles that are designed to operate on gasoline could also operate on E-10, a blend of 10% ethanol with gasoline. Since E-10 was not commonly available at WL or other sites in FY 2007/2008, none of the gasoline vehicles operated on E-10. E-10 is provided for onsite fuelling at CRL and vehicle operators at Sheridan Park have been instructed to use E-10 where possible.

Table 3-1
Summary of Alternative Fuel Usage in FY 2007/2008

MOTOR VEHICLE ALTERNATIVE FUEL USAGE SUMMARY	2007/2008
Total number of motor vehicles in fleet	143
Total number of vehicles for which it is "cost effective and operationally feasible" to operate on alternative fuel (< 50% ethanol blend)	95
Total number of subject motor vehicles actually operated using alternative fuels (< 50% ethanol blend)	95

4. EVALUATION CRITERIA

4.1 Acquisition

To determine which AECL vehicles were subject to acquisition provisions of the *Alternative Fuels Act* [1], Section 4, "Acquisition", of the Treasury Board of Canada Secretariat's "*Guide to Fleet Management*" [3] was used. Section 4.7.1 of the act, *Criteria for Selecting an Alternative Fuel Vehicle,* requires that cost-effectiveness and operational feasibility be taken into account.

4.1.1 Cost Effectiveness

Is defined as;

> ***Cost-effective*** *— In the context of analyzing options for alternative fuel use, cost-effectiveness is demonstrated when the additional cost of either converting the vehicle to use an alternative fuel or acquiring a factory-produced alternative fuel vehicle will be recovered in the form of fuel savings, environmental benefits, or visible leadership benefits over the life of the vehicle.* [2]

Life cycle cost criteria considered by AECL includes cost effectiveness, annual travel, capital cost and vehicle life. The vehicle life at AECL is three years based on the standard three-year lease agreement that light duty vehicles fall under. Therefore, the payback period must be three years or less to make it cost effective when acquiring a vehicle to specify that it be capable of operating on an alternative fuel.

To calculate the payback period, the additional capital cost to equip the vehicle with the capability to operate on an alternative fuel is divided by the annual fuel savings that would be incurred by operating that vehicle on that alternative fuel.

The following criteria were used to determine life cycle costs: yearly mileage, fuel consumption, fuel costs and conversion costs.

An example calculation to determine the cost effectiveness of converting a vehicle acquired for use at CRL to propane follows.

Fleet Number: 715 **MAKE:** 2007 Chev Pickup **MODEL:** K1500 4WD

Annual Travel: 36,000 km **Fuel Consumption:** 15.7L per 100 km. Data obtained from the 2007 Fuel Consumption Guide [4].

CONVERSION COST

Additional cost to equip the vehicle to operate on propane: $4,600.00

FUEL COSTS

Fuel cost average for 2007/08 Unleaded gasoline: $1.07/litre Propane: $0.61/litre

ANNUAL FUEL CONSUMPTION

Yearly mileage divided by 100 x litres/100 km. = litres of gasoline

$(36,000 \div 100) \times 15.7 = 5,652$ litres

Conversion factor to convert gasoline litres to propane litres is 1.36

$5,652 \times 1.36 = 7,687$ litres of propane

FUEL SAVINGS

(litres of gasoline x cost/litre) – (litres of propane x cost/litre) = fuel savings per year

$(5,652 \times 1.07) - (7,687 \times 0.61) = 6,048 - 4,689 = \$1,359$ per year

As indicated by the cost of conversion of $4,600 and a fuel saving of $1,359 per year, it is not cost effective to use propane as an alternative fuel.

4.1.2 Operational Feasibility

To determine which AECL vehicles were subject to operation provisions of the *Alternative Fuels Act* [1], Appendix C of Treasury Board of Canada Secretariat's "*Guide to Fleet Management*" [3] - "Assessing operational feasibility" was considered. Under this section, in order for it to be operationally feasible to operate a vehicle on an alternative fuel, all of the following should be in place:

i. fuel must be available for the area of vehicle operation and range of the vehicle;

ii. vehicle service and maintenance support must be in place;

iii. the vehicle must meet operational and tailpipe emission requirements while operating on an alternative fuel;

iv. the vehicle must be durable for the operating environment;

v. certification and adequate warranty for conversion work must be available; and

vi. the manufacturer's vehicle warranty must not be affected.

4.1.2.1 Operations with Propane

Each of the six criteria above was evaluated with respect to operating the vehicle on propane.

The evaluations were:

i. Fuel must be available for the area of vehicle operation.
At CRL, the supplier has removed the on-site propane fuelling station due to the reduction of product sales. At Sheridan Park, propane is readily available at local fuelling stations near the site. At Whiteshell, propane is not readily available.

ii. Vehicle service and maintenance support must be in place.
The vehicle maintenance personnel at CRL have been trained to service propane vehicles. Vehicles at Sheridan Park and other AECL sites are maintained at local qualified service centres.

iii. Vehicle performance must meet operational and emission requirements.
The installer would test vehicles at all AECL sites and maintain them using approved equipment.

iv. The vehicle must be durable for the operating environment.
In general, propane fuelled vehicles have a reputation of being difficult to start in cold weather. This issue has been reduced significantly by the use of dual fuel conversions.

v. Vehicle conversions must be certified with adequate warranty.
The conversion installer would be required to be certified and provide an adequate warranty.

vi. Manufacturer's vehicle warranty must not be affected.
The vehicle warranty would be unaffected.

4.1.2.2 Operations with E-10 (<50% Blend)

Each of the six criteria was evaluated with respect to operating the vehicles on E-10. The evaluations were:

i. Fuel must be available for the area of vehicle operation.
Fuelling stations were not always available in the area of operation for Whiteshell Laboratories and Other sites making the use of E-10 problematic. E-10 fuel has been available at CRL since 2006 April. E-10 continues to be available for automobiles and light duty trucks at Sheridan Park.

ii. Vehicle service and maintenance support must be in place.
The vehicle maintenance personnel at CRL have been trained to service gasoline vehicles and additional training is not required to service vehicles operating on E-10. At all other AECL sites, vehicle maintenance is obtained at approved service centres.

iii. Vehicle performance must meet operational and emission requirements.
Vehicle performance would be satisfactory while meeting emission requirements.

iv. The vehicle must be durable for the operating environment.
Durability would not be an issue.

v. Vehicle conversions must be certified with adequate warranty.
No conversion would be required.

vi. Manufacturer's vehicle warranty must not be affected.
The vehicle warranty would be unaffected.

4.1.2.3 Operations with >50% Blend

Each of the six criteria was evaluated with respect to operating the vehicles on >50% blend. The evaluations were:

i. Fuel must be available for the area of vehicle operation.
Fuelling stations were not available in the areas of operation for CRL, Whiteshell Laboratories, Sheridan Park or Other sites.

ii. Vehicle service and maintenance support must be in place.
The vehicle maintenance personnel at CRL were not trained to service vehicles operating on >E-10 fuel. At other sites vehicle maintenance would be required at approved service centres.

iii. Vehicle performance must meet operational and emission requirements.
Vehicle performance would be tested by the installer.

iv. The vehicle must be durable for the operating environment.
Durability would not be an issue.

v. Vehicle conversions must be certified with adequate warranty.
Conversions would be made by the manufacturer.

vi. Manufacturer's vehicle warranty must not be affected.
The vehicle warranty would be unaffected.

5. FUTURE COMMITMENTS

AECL will continue to meet the requirements under the *AF Act* [1]. AECL will promote the use of Ethanol blended fuel (E-10) on sites where it is available.

6. SUMMARY

AECL has met its obligations under the *AF Act* [1] for 2007/08. The Act requires a minimum of 75% of new vehicles acquired by a Federal body or a Federal Crown Corporation to be capable of operating on alternative fuels where cost effective and operationally feasible and requires the obligatory use of alternative fuels in vehicles so equipped. Eighty-eight percent of new vehicles acquired by AECL in 2007/08, where cost effective and operationally feasible, were operated on <50% ethanol blend fuel. Of a total of 143 vehicles in the AECL fleet, it was cost effective and operationally feasible to operate on <50% ethanol blend fuel for 95, or 66% of, vehicles.

7. REFERENCES

[1] *The Alternative Fuels Act*, (1995, c.20).

[2] 2007 Government Motor Vehicles Ordering Guide, Pubic Works and Government Services Canada.

[3] Treasury Board of Canada Secretariat's "*Guide to Fleet Management*", 2007 June 08.

[4] Energuide Fuel Consumption Guide 2007, Natural Resources Canada (NRCan).